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ABSTRACT

The two goals of this program were to increase the number of classroom teachers using the lab and to increase the amount of time that the science lab was used. The solution strategy chosen was a combination of peer tutoring, orientation presentations, small group discovery experiments and activities, and individual science experiment stations. The prerequisites to the actual implementation of the new science instruction approach were to set up topical hands-on experience stations, train sixth grade students to serve as individual assistants at each station, and to invite the intermediate classes to come to participate in lab activities on a weekly basis for a 10-week period. Three areas of science were covered--Earth Science, Plants, and Oceanography. During the 10 weeks of the program, the classroom teachers' only responsibilities were to meet for the teacher orientation session, and to bring their classes to the lab at their scheduled time. Included in this paper are the purpose, research, method, results, and recommendations. Appended are two teacher surveys on the science lab facility. (Author/ KR)

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SCIENCE LAB: A PEER APPROACH

by
COURTNEY C. RONCA

A Practicum Report
submitted to the Faculty of the Center for the
Advancement of Education of Nova University
in partial fulfillment of the requirements
for the degree of Master of Science

December, 1985

Running Head: IMPLEMENTING A SCIENCE LAB

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ABSTRACT

Science Lab: A Peer Approach
Ronca, Courtney C. 1985, Practicum Report, Nova University, Center for the Advancement of Education.

Descriptors: Demonstration (Educational)/Discovery Learning/Experimental Learning/Learning Centers/Peer Influence/ Peer Teaching/Science Activities/Science Curriculum/ Science Education/Science Experiments/Science Instruction/ Science Projects.

The writer implemented an intensive science program for the fourth, fifth and sixth grade students plus one self-contained SLD class of intermediate students. The two goals of the program were to increase the number of classroom teachers using the lab and to increase the amount of time that the science lab was used. All of the regular intermediate teachers, and one self-contained learning disabled intermediate teacher used the lab. The implementation lasted ten weeks with the lab being used by approximately three classes per day four days a week. The fifth day was used to primarily clean up and reorganize for the next week's activity. A multi-media approach was used for the introductory overview for each of the three major science units. The overview lessons were conducted by two sixth grade students. Phase two of the program included a class experiment with accompanying worksheet activities. This was also student led. The final phase of each unit was a series of ten different experiments relating to the unit. Thirty lab stations were set up to accomodate classes of up to thirty children. Each station was manned with a sixth grader who acted as an assistant in deciphering directions, or helping with equipment and safety. Results indicated that both objectives were met: the number of students using the lab and the amount of time the lab was in use both increased. The program achieved recognition in the county by the district science supervisor. It will also be featured in a slide-tape show for the teachers of Volusia County. It was recommended that the program be continued and extended to the gifted centers.

AUTHORSHIP STATEMENT

I hereby testify that this paper and the work it reports are entirely my own. Where it has been necessary to draw from the work of others, published or unpublished, I have acknowledged such work in accordance with accepted scholarly and editorial practice. I give this testimony freely, out of respect for the scholarship of other workers in the field and in the hope that my own work, presented here, will earn similar respect.

Timothy L. Pence

TABLE OF CONTENTS

Title Page i

Authorship Statement ii

Abstract iii

Table of Contents iv

Observer's Verification v

Chapter

I Purpose 1

II Research 6

III Method 19

IV Results 27

V Recommendations 30

Reference List 32

Appendices

Appendix A 37

Appendix B 38

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Courtney Ronca very successfully conducted a peer approach science lab program during our first grading period 9-10 wks at Pine Trail. I am a co-worker and can attest to daily lab participation.

Practicum Title Science Lab - A Peer Approach

Student's Name Courtney A Ronca

Program Site Pine Trail Elementary Date 12/19/95

Observer's Name Alicia Collins, Alicia Collins
(please print ----------and sign)

Observer's position 4th Grade Teacher

CHAPTER I

PURPOSE

The site for this practicum was an elementary school located on the eastern coastal region of central Florida. Small farms and wooded areas surrounded the buildings which included a school water treatment plant. The facility was divided into four pods, which had moveable walls to allow for versatility of classroom organizational patterns. In addition to these pods, the facility included administrative suites, a cafeteria, an art suite, a music room, a media center, a multi-purpose room, a special education wing and a science lab.

The enrollment of the school was slightly over seven hundred students who were grouped into twenty-four classes ranging from kindergarten through the sixth grade. In addition to the regular classes, there were three units for exceptional students: a class for three and four year old language delayed children, a class for the physically impaired, and a combination SLD-EH class. Chapter I served those pupils who had repeated the first grade, and also the second, third and fourth graders who needed remediation. Other full-time staff members included a primary resource person, as well as specialists in art, music and physical education. A vision specialist, school psychologist, mental health technician, school nurse and social worker serviced the

school on a part-time basis.

Most of the students were from a white, middle class, socio-economic group. A small percentage, 8%, were minority students of which 7% were black Americans.

Parental concern and interest in the school was evidenced by the very active PTA and a Volunteer In Public School program which received the Golden School Award for outstanding participation.

The school had a principal, an assistant principal, a secretary, and two clerks. Each subject area had a contact person to disseminate information and materials from the county office, and to work with the school curriculum coordinator advisor in the development of appropriate programs. In the 1985 Southern Association of Colleges and Schools (SACS) interim review, it was indicated that more materials should be purchased, and better utilization of the lab was needed to improve the science program.

The science contact person, along with the curriculum coordinator, requested funding for the needed lab materials. The steering-budget committee allocated eight-hundred dollars for that purpose in the 1985-1986 school year.

The school was provided with a lab room where science activities could be conducted. The reasoning behind this provision was based on state emphasis in the areas of science and math. The PTA expressed its support by allocating a

substantial amount of money to supply the science lab with models and equipment. The administration encouraged the teachers to take their classes to use the lab. In order to use the lab, teachers reserved the lab room for a specific time in the science schedule book, which was located in the office. The schedule book indicated that the lab was being used approximately three hours of the thirty available hours per week.

The researcher, as the science contact person, surveyed the teachers (see Appendix A for a copy of the survey) to determine why the science lab facility was not being used more often. The results of the survey were revealed in the following statements:

1. Eleven percent of the teachers used the lab for science activities.
2. Forty-one percent stated that they did not go to the lab because their time was too limited.
3. Forty-seven percent felt that setting up experiments and cleaning up afterwards was inconvenient.
4. Seventy-three percent of the faculty did not use the lab because experiments and directions were not readily available.
5. Seventy-one percent of the teachers felt that appropriate materials were not provided in the lab.
6. Forty-seven percent wanted to see a general experiment schedule set up for each grade level.

In summary, the PTA had supported the use of the science lab by its outlay of funds. The administration had encouraged the faculty to use the lab by talking about it at faculty meetings. The teachers had stated in the SACS self-study that the utilization of the science lab should be improved. However, the science lab remained virtually empty and void of any science activities and that was the problem.

The success of this practicum was to be measured by the attainment of the following objectives:

1) Over a period of ten weeks the number of teachers using the science lab would increase by at least fifty percent of the classroom teachers (from eleven percent).
2) Over a period of ten weeks, the average amount of time the science lab was used each week would increase from three hours to at least ten hours.

The state department, the administration, the teachers and the parents had agreed that science activities were important to a child's development. If the number of teachers using the lab increased, it would be reasonable to assume that the number of children using the lab would be increased. If the average number of hours in the lab increased from three to at least ten hours per week, then it could be safely assumed that the students would

be spending more time doing science related activities and that the lab would be more effectively utilized.

CHAPTER II

RESEARCH

The art of teaching was defined as leading a person through a series of planned experiences with the hope that, at the end of the series, the learner would be able to solve new situations on his own. Ideal guidance meant that the teacher had the sensitivity and the power to keep the learner from straying from the task at hand. In Rosenbaum's (1973) words, guidance meant control. According to him, ideal control was never achieved because the person guiding lacked some degree of ability to understand the learner or could not intervene with maximum appropriateness to the learning situation.

In 1912, Edward Thorndyke made an analysis of print technology. He stated that if a book knew the learner's experience, so that the learner could not advance to page two until a clear understanding of page one was evidenced; then personal instruction could be replaced by printed material.

Many pressures to cut costs have plagued the education system in recent years. Accountability and performance objectives were terms that reflected an educationally cost-conscious society that was dissatisfied with the results

being produced in certain areas. For example, the Federal Right to Read program recognized that conventional techniques had not worked well in the skills of reading in many instances. The government accepted the necessity of inventing and implementing new approaches. Education always had to struggle to keep up with society's demands. Those demands had been the catalysts for change over the years.

Educators often complained about the ratio of pupils per teacher. One cost effective means to reduced that ratio was to plan a buddy-system. Using certain students to be peer teachers was a means to achieve instructional gains at a low cost.

Peer teaching usually involved a one-on-one situation. Ely and Larson in 1980 defined it as the term "peer tutoring" which had been used in literature to describe situations in which a person provided instructional assistance and guidance to another person. They went on to say that the process of peer tutoring was not a new concept, as children had been teaching each other for a long time. Their research further explained that literature in anthropology mentioned that many societies expected transmission of information and skill from older to younger children. For example, the American settlers had to rely on the more mature of their children to handle homemaking and caretaking chores, and to teach these tasks to younger siblings while the parents attended to matters outside of the household.

The work of Ely and Larson in 1980 also discussed peer tutoring in the early community. Children were sent to one room school houses to receive their instruction; older or more able students were given the responsibility of teaching younger or less gifted students on a part-time basis. Children were able to learn their lessons even in a multigrade classroom with only one teacher.

In 1972, J. Bruner urged that education be a communal undertaking in contrast to the competitive structure in schools. He went on to say that by giving older children some responsibility for helping others - especially younger children - the intermediate generation of youth gained a sense of purpose and useful participation all too often lacking in their lives.

Critics of this process probably thought that children were not knowledgeable enough to be in charge of each other's learning, but experts had good evidence that lacking total commmand of a subject was not necessarily the key factor for passing on knowledge.

Moore (1968) explained it by saying that the tutor was the one who cared rather than the one who knew. He felt that there was no substitute for the individual tutorial, and that its function was not to instruct. He felt that the true function was to set the student to the task of expressing his thoughts articulately and then assist him

in subjecting his creativity to critical examination and reconstruction.

There were many advantages to peer tutoring. Some of the benefits were as helpful to the tutor as they were to the tutee. For instance, if a child were socially immature as a result of poor socialization, the interaction with a younger child would afford optimal positive reinforcement; thus, young children could help socialize older children, (Allen, 1976).

Melby (1964) discussed the fact that a relationship existed between the ability to solve problems creatively and self-acceptance coupled with self-confidence.

According to Webster (1985) some of the valuable life skills that a peer helper learned besides socializaiton were: planning methods to deal with problems, public speaking, teaching one-on-one, listening to others intelligently without making judgements, leading through the resolution of a problem, criticizing others in a constructive manner, and empathizing with the problems of others.

In the Coleman study (1974), it was noted that youth should have responsibilities that affect the lives of other persons in order to function adequately as contributing members of society.

Sivasilam Thiagarajan wrote a book on tutor aids in 1978. He dedicated it to Dr. Douglas Ellison of Indiana

University who had imported information from developing countries to developed ones. Tutor aids were closely related to Dr. Ellison instructional tutoring which attempted to offer a technology with a human face and to achieve individualization through interaction with tutors.

In a 1973 report, D.J. Klaus stressed that peer tutoring techniques were especially affective in developing countries where schools were understaffed.

According to the findings of J.S.R. Goodlad (1975), a large number of tutorial programs using children to teach other children were in operation throughout the United States and were beginning in Britain.

The first attempts to create a system of peer mediated instruction were begun at Teachers College Columbia University. Elementary students were borrowed from their regular classes in pairs. The results were sufficiently impressive to convince all of those who worked on the program that they could, with strong justification, proceed to design, develop, and performance test, a large-scale general purpose system of instructional control based on peer mediation (Rosebaum 1973).

Another peer tutoring study was conducted in an inner city elementary school in Palo Alto, California. The teachers and administrators who participated in the program all responded positively when asked if the program should be

continued the following year (Olson, 1979).

The opinions of Gartner, Kohler and Riessman (1971) concluded that when a child teaches another child in school, both the older and the younger child profited in terms of better academic achievement and improved social behavior. These findings influenced one to believe that peer tutoring was instructionally effective, cost efficient, and beneficial to children in the areas of academics and character development.

Science instruction had a been a major concern to educators in recent years. The traditional methods of presenting materials to students seemed to be lacking when it came to producing students who applied the problem solving thought processes involved in scientific problem solving. The effort to achieve success in this area brought us to an era of the hands-on learning experience approach.

What an experience! These words implied emotional and intellectual involvement in some happening. A person had to be part of an event for it to be considered an experience. The experience attained meaning through the actual living it, telling it, and analysis of it (Landsdown, 1971).

Elementary school students exhibited an overwhelming enthusiasm for science classes in which they were cast in the role of active learners. They found excitement in

hands-on experiences that afforded them an opportunity for personal involvement in topics being studied, and they enjoyed most those activities which presented challenging problem-solving situations (Allen, 1981).

The learning-by-doing approach promoted the development of student abilities and recognition and understanding of basic science concepts and principles far more effectively than did a mere reading, talking or other descriptive exposure. But it also posed a problem - it made heavy demands on teacher time, energy, and resources to provide an ample supply of varied and suitable activities throughout a school year (Allen, 1981).

Science teachers knew that the best way to reinforce a concept or a principle was through experimentation and that it was far more meaningful when the pupils were actively involved in the problem solving. Baldini (1973) suggested that to effectively use the scientific method, activities should begin with questions that students tried to answer. Of course, there would be some questions that students couldn't be expected to answer and some experiments should be planned for them.

David Butts wrote a book entitled, Teaching Science in the Elementary School in 1983. In his book he stated that a child did not merely learn by doing, but learned

best when activities were guided, structured, questioned, and challenged by the teacher. According to Glass (1967), learning how to investigate scientific problems was one of the major functions of science.

Scientists and educators have been continually challenged to deal with a subject that changes at a very rapid pace. The traditional elementary school science curricula rarely met the demands of our modern scientific-technological-industrial society. In their text on new directions in teaching science, Hurd and Gallagher (1968) warned that without new approaches to elementary school science instruction, we ran the danger of children becoming strangers within their own culture.

Scientific knowledge has not been absolute; it was subject to change as more facts were known. Many theories of the past were modified and even abandoned when new information was discovered. Scientific laws had to be modified so that they could more faithfully represent the facts (Duhem, 1962).

The thought processes related to science ranged from simple to complex. Piaget (1969) commented that intellectual development was gradual and continuous, creating a merging or blurring of labels. He categorized these levels of thought in the following four stages:

1. At the sensorimotor level, during infancy to about

eighteen months, the child assimilates sensations and interacts with unfamiliar objects.

2. At the preoperational level, which occurs from about eighteen months to seven years of age, the child exercises his or her perception.
3. At the level of concrete operations, from the approximate ages of seven to eleven, logical thinking operations begin and the child can recognize several factors at a time.
4. The level of formal operations begins about the eleventh year, the child can then state hypotheses, test them, and formulate conclusions.

Progress at these levels depends on how mature the child is, how much experience the child has had, and how the child has processed the information supplied by people in his or her environment (Piaget, 1969).

It was pertinent for science teachers to be aware of a child's general stages of mental development, so that activities could be effectively correlated with ability levels. The processes of science involved making observations and measurements, drawing inferences, interpreting data, using intuition, generalizing from a few cases to many, making predictions, testing predictions for validity, making assumptions and guesses and experimenting (Hurd, Gallagher, 1968; Esler, 1977).

These process skills in science were compared to a computer program. Computers were not able to handle information without a program to provide the directions; the human mind did not cope effectively with incoming information in the absence of learning strategies (Newell, Shaw, Simon, 1958).

Richard Suchman (1961) formulated four types of science processes to be used in the elementary schools. The first type was obtaining information which was already perceptuallly available - what was at hand and needed only to be noticed or observed. Many elementary school teachers stressed this aspect of learning almost exclusively. The second type of process skill was the ability to measure and use numbers to represent measurements. The abilities made it possible to think about objects in a numerical sense and to understand such concepts as weight, space and time. A third category was to allow the learner to go beyond the information that was acquired. These skills were related to organizing data so that patterns and relationships could be detected. This organization involved noting similarities and differences, detecting trends, making inferences and predictions, and in other ways bridging gaps in information. The fourth category consisted of skills which were actively seeking new information through experimentation and in developing models to explain data. These inquiry skills focused on formulating questions

to gain information useful for developing an explanation of an observed event. The ability to ask significant questions was always one of the important ways in which knowledge advanced in science (Suchman, 1961).

The new movement in teaching elementary school science was stimulated by discovery learning. The central question was whether whatever a child learned was more meaningful and was retained longer if he worked his own way through a topic or if it were taught him by assertion. Proponents of the discovery approach cited the following values in its favor (Bruner, 1961):

1. Children were motivated by the satisfaction they received from finding things out for themselves, and satisfaction was recognized as an important attitude in stimulating learning.
2. Since children were more personally involved with information and ideas in a discovery approach, deeper understanding of the subject matter resulted in forgetting was reduced.
3. Discovery procedures helped children develop strategies of inquiry such as simplifying, organizing data, summarizing, discovering relationships and making generalizations.
4. Transfer of learning was improved.

What constituted discovery was sometimes misinterpreted. Children were not expected to rediscover for themselves all of the concepts of science. Atkin and Karplus (1968) suggested a three phase activity plan for science instruction. They began with an exploratory phase, where children were allowed to get a feel for the topic by exploring materials. In the second phase, the teacher helped the children formulate a unifying idea to help organize their experiences. In the final phase, students used their knowledge for discovering applications.

In another view of discovery learning, children explored freely with materials of a topic until they began to ask questions of their own. These questions formed the basis for further investigation (Hawkins, 1965).

Discovery learning had certain limitations. It was a slow process and required training in methods of discovery. Less course content was covered in a given period of time than by the more formal means of transmitting knowledge (Hurd, 1968). A more acceptable approach to the pure discovery technique was to allow children to experience directly, but to add a substantial amount of guidance discussion from the teacher (Karplus and Thier, 1967).

The new ideas about the ways children learn implied a need for changes made in the teaching and organization of science instruction. To achieve science literacy in children, the curriculum needed to provide the pupils with experiences

that were new and different from the usual ones and to establish or reinforce scientific concepts. New programs in science represented the efforts of scientists, educators and psychologists to provide materials for more meaningful and potentially more beneficial programs for children.

In the words of Isacc Newton, "Each scientist stands on the shoulders of those before him."

CHAPTER III

METHOD

The solution strategy chosen was a combination of peer tutoring, orientation presentations, small group discovery experiments and activities, and individual science experiment stations. Research indicated that an effective approach to teaching science would incorporate hands-on experiences or no research on the use of peer tutoring in a science lab setting; however, the many positive aspects of this teaching-learning technique made it appear to be a good solution for resolving some problems inherent to a hands-on approach to science instruction. In this particular situation, it was expected to increase enthusiasm on the part of the students, which would hopefully generate energy to the teachers, who would want to see this program continued.

The prerequisites to the actual implementation of the new science instruction approach were to set up topical hands-on experience stations, train sixth grade students to serve as individual assistants at each station, and finally, to invite the intermediate classes to come to participate in lab activities on a weekly basis for a ten week period.

The fears of the administration and PTA that the lab was not being used would be allayed when they realized that the lab was in constant beneficial use to the students.

The budget committee had alloted funds for the purpose of ordering supplies and lab materials, therefore, no extra cost was incurred outside of the regular science budget.

Initially, this program took a great deal of planning and preparation. Because of time constraints, the program was specifically designed for the intermediate grades. The primary grades attended science lab at the teacher's discretion.

The peer-tutoring science lab strategy seemed to be the best way to motivate the teachers to use the science lab. because it only required cooperation and no extra work on the part of the already overextended classroom teacher.

Three areas of science were covered - Earth Science, Plants, and Oceanography. Each topic was given a three week time block. The first week was spent by familiarizing the students through a media orientation and displays. The second week was devoted to small group hands-on experiments to give the children exploratory open-ended experiences. The third week was the culminating session where each student participated in at least ten different hands-on experiments with the help of a peer tutor at each station.

The sixth grade peer tutors were trained by going through the experiments first, and practicing tutoring techniques on each other under the supervision of the researcher.

Teachers were scheduled for the science lab in increments

of forty to sixty minutes. During the ten weeks of this practicum, the classroom teachers' only responsibilities were to meet with the researcher for the teacher orientation session, and to bring their classes to the lab at their scheduled time.

Each time a new unit began, the room was decorated with posters, pictures, models and specimens pertaining to that particular subject. Sometimes children shared collections and articles which related to the area of study.

Teachers in the fourth, fifth and sixth grades were told what and when each lab unit would be before the start of the program. This was done so that teachers were able to use the lab experiences in conjunction with science units taught in their own programs. Those who used the lab experience that way reaped the most benefit from it.

Science units were organized around a three week schedule (see sample schedule on following page).

SAMPLE SCHEDULE

TOPIC - EARTH SCIENCE

Week 1 - Media Presentation

	Monday	Tuesday	Wednesday	Thursday	Friday
Grades and Sections	4A 4B 4C	5A 5B 5C 5D	6A 6B 6C 6D	LD/EH PI Clean UP	Primary Day

Week 2 - Small Group Activies

	Monday	Tuesday	Wednesday	Thursday	Friday
Grades and Section	4A 4B 4C	5A 5B 5C 5D	6A 6B 6C 6D	LD/EH PI Clean Up	Primary Day

Week 3 - Lab Stations - Individual Experiments

	Monday	Tuesday	Wednesday	Thursday	Friday
Grades and Sections	4A 4B 4C	5A 5B 5C 5D	6A 6B 6C 6D	LD/EH PI Clean Up	Primary Day

Each unit began with an orientation of the unit. A variety of media was used for this purpose, which included the following: transparancies, slides, tapes, read-a-long books, films and filmstrips. Two sixth grade students were assigned to each intermediate class. It was their responsibility to learn a script for conducting the lab instruction of their assigned class. This team had to give a welcoming speech, work together when doing a transparency lesson on the overhead projector, and provide guidance for read-a-long tapes or filmstrips. When students gave a transparency lesson, it was necessary for one child to read the information while the other simultaneously pointed out the particular areas which related to the script. The dialogue for the scripts had to be written out very carefully with well-chosen words which could be pronounced easily by the students. Specific directions helped to make the presentations flow on their own if the scripts were followed to the letter.

During the second week of a particular science unit, classes were given an experiment to do. This meant that all of the children worked through the same experiment at the same time. A team of two to four sixth grade students were present to assist the class which had been separated into small groups. Work sheets which related to the topic and experiments were distributed to the children to reinforce their knowledge of the lesson.

In the final week of the unit, the rotating lab experiment system was put into use. Thirty lab stations were set up in three sections labeled A, B, and C. A class of children would come to the lab and before entering the door, each child was given a section letter and a lab number. Once given the section letter, the child would stay in that section throughout the lab period. Every five minutes the bell would ring and the student would advance to the next higher numbered station. For example, a child who began at station 2C would go to station 3C, 4C, and so on. Each station was manned with a sixth grader who acted as an assistant in deciphering directions, or helping with equipment and safety. Most stations had short work sheets to accompany them.

Sometimes one sixth grader would conduct an activity for three students at once. This worked very well for matching games or something that was related to art and science.

In the oceanography lab, as a culminating activity, each class made a wreath of shells which was taken to each room to keep and display.

Some of the students were assigned to the task of the clean-up jobs. This crew usually consisted of three children who had to collect soiled glassware, carry it to the washing station, clean it, and get it back to the original place within a five minute time slot. This same group had to roll large trash cans to the dumpster, keep carrying buckets of hot soapy water

from the cafeteria, and keep everyone's fresh water supply filled. At the end of three lab clases, the clean up crew was exhausted, but proud!

The sixth graders were allowed to switch lab stations in the afternoon of each lab day. They were placed at a station of their own choice, and if too many children wanted one station, they drew numbers for it.

Parent volunteers were used to help supervise the lab during the third week of each unit: especially if there was a station that involved any degree of risk. (Several experiments used heat and glass.) All children were required to wear safety goggles at those stations. Also, blankets were put over their bare legs in case hot steam spurted out. Kitchen mitts were used to protect their hands and the fire extinguisher was removed from the wall and placed at the station. In planning the experiments, stations requiring extra safety precautions were limited to one per unit.

Our school was most fortunate to have been adopted by the Publix Supermarket whose manager supplied us with many consumable items. Culminating lab activities would have cost about $50.00 in consumable materials to service approximately three hundred and fifty students.

For this ten week period, the researcher was responsible for scheduling the lab, orienting the teachers involved to

the new approach, training the peer tutors, massing materials, writing instructions for peer leaders, setting up experiments and supervising the clean-up.

CHAPTER IV

RESULTS

The strategy to increase and improve the usage of the science lab for the intermediate classes was to design a hands-on activity program for a ten week period. The teachers had indicated in the SACS self-study that utilization of the lab should be improved. This lent further support to the contention that the lab was not being used adequately. The success of the program depended on the cooperation of the intermediate teachers' adherance to the schedule.

Prior to the initiation of the program, only 11% of the teachers had used the science lab during the semester prior to the implementation of the practicum. One of the objectives of the practicum was to increase the number of teachers using the lab from eleven percent to at least fifty percent. The sign-in book for the science lab indicated that fifty-three percent of the classroom teachers used the lab during the ten week period of the practicum implementation. One hundred percent of the intermediate teachers used the lab during this time.

The second objective of the program was to increase the average amount of time of science lab activity from three hours to at least ten hours each week. During this practicum, the science lab was used by the classes on an average of eleven hours per week, so that objective was met.

The teachers were resurveyed at the end of the ten week period (See Appendix B for a copy of the survey).

Every teacher surveyed agreed that they would like to see the lab program continue. Several said that they would be willing to create a lab unit for the science department. Three teachers agreed to create some individual experiments to be shared. Most comments indicated that the teachers felt the lab experiences had been very beneficial to both the peer teachers and their classes. Another result of this lab was that the intermediate teachers would like to have a full-time science instructor who would not have any other responsibilities except those of the science lab.

One comment that a few teachers and many of the sixth grade student lab leaders made was that they would have liked more time at each station during the third week of each unit. It was suggested that there be fewer experiments, but an increase in the time allotted to each experiment from five minutes to seven minutes.

Other comments from the surveys were as follows:

"Interesting subject matter-was well prepared."

"Great exposure to lab equipment."

"This kind of learning jumps right out of the book and becomes real."

"The kids loved it."

"Measuring, seeing and believing, being in charge, being excited, using and taking care of lab stations."

"Fantastic."

In summary, the two goals of this practicum were to increase the number of teachers using the science lab with their children and to increase the amount of time the science lab was used. Both goals were fully achieved.

This practicum project received a great deal of positive publicity. The practicum project will be featured in the educational bulletin printed by the Volusia County Department of Education. Slides of the children in action in the science lab were requested by the County Science Supervisor's Office for a slide-tape presentation to be shown to the teachers of Volusia County. A video cassette is available which shows the lab in session.

CHAPTER V

RECOMMENDATIONS

Since the results of this practicum were positive and the teachers and students expressed an enthusiastic interest in seeing the program continue, the implementor of this practicum in her roll as the science contact will carry the program into the following year using the materials which have been developed during the practicum. In order to further involve faculty members, it is recommended that the science contact conduct an in-house workshop for the purpose of developing more units and training other faculty members.

Because the work load was too great for a regular classroom teacher to bear for an extended time, while trying to maintain the regular program, it is hoped that the school eventually will be given a science teacher who would work exclusively in the lab with both primary and intermediate children.

The work in the lab was very intense and was received with overwhelming enthusiasm by the students. Therefore, the program should continue, but at a less intense pace so that it is humanly possibly to continue.

Some students from a gifted center not located at this facility visited the school and participated in one of the lab units. They wrote letters asking to return.

It is recommended that the strategies involved in the implementation of this program be shared with gifted program instructors in the hopes that this type of program will be used with gifted students throughout the county.

The primary children also need to experience hands-on learning in the science area. It is therefore recommended that an additional program be written which would begin with and encompass the kindergarten through the third grade.

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Appendix A

Teacher Survey - Science Lab Facility

		Agree	Disagree
1.	I don't go to the lab because my time is too limited.	_____	_____
2.	It's a lot of trouble to find the materials.	_____	_____
3.	It's not convenient to try to clean up after many experiments.	_____	_____
4.	I don't know quite what to do after I get there.	_____	_____
5.	I would probably use the lab more if the experiments were set up and directions were provided.	_____	_____
6.	The materials that I need are not provided.	_____	_____
7.	I'm afraid I'll ruin the carpet.	_____	_____
8.	The sign up system is not good for long range experiments.	_____	_____
9.	I would like to see an overall experiment schedule by grade level.	_____	_____

10. Please list any supplies you would like to have ordered for your experiments.

_____

_____

_____

_____

_____

APPENDIX B

Dear

Would you mind making a few comments about the science lab program? Please mention a few positives and a few things that could have been improved. Would you like to see it continued?_____ Would you be motivated to help create a unit? _____ An experiment?_____

Thank you so much.

Scientifically,

Courtney